

Conversational Access to On-Line Cancer Information: An Adaptable Speech Interface

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For many people, accessing on-line medical information is a daunting task. The interface typically lacks clarity and ease of use. Details such as how to express the information need, modify a search, or interpret the search results, must be gleaned from an experienced user or learned through trial and error. And if the system is used infrequently, the interface has to be re-learned each time. The problem is not simply one of bad interface design. The problem is that new users of a system require a radically different form of interaction from experienced users. New users need absolutely clear, tutorial-type guidance; experienced users need simplicity and efficiency.

Our work is concerned with the design of *conversational speech interfaces*. These interfaces are designed to be easy for new users, efficient for experienced users, and adaptable so that they can meet the user's desired level of interaction. Conversational speech interfaces adhere to natural conversational conventions such as those we use in our everyday interactions. They also include familiar conversational gambits such as interrupting, changing the subject, and redirecting the conversation. Two modes of conversation will be presented in the demonstration, one in which the user *navigates* the graphical user interface, the other in which the user *bypasses* the graphical user interface. Both modes of interaction are shown to be essential to the interface's ease of use and its adaptation to different kinds of users.

The information-retrieval system we will demonstrate provides uniform access to several diverse information sources. The general architecture of the system consists of three components:

- the *information sources* themselves,
- a program, called the *Knowledge Server*, which is accessed over the Internet and which indexes, retrieves and summarizes information in the sources,
- the *conversational user interface* which integrates speech input, audio output, text output, animation and other kinds of graphical

displays to provide unified, hands-free access to relevant information in the sources.

Three sources are currently available to the speech interface: PDQ, the National Cancer Institute's (NCI) database of cancer information for health professionals and patients; CANCERLIT, NCI's database of bibliographic citations on published cancer research; and the textbook by De Vita et al., *CANCER: Principles and Practice of Oncology*. The Knowledge Server exploits the resources of the National Library of Medicine's Unified Medical Language System (UMLS). Extensive use is made of the UMLS Metathesaurus, a database of information on the concepts that appear in different controlled medical vocabularies and classifications used in biomedicine. The Metathesaurus, a synthesis of existing terminologies, acts as a super index into the diverse information sources, linking different words, phrases and terms within each source using the notion of synonymy. The Knowledge Server also indexes the sources using words and phrases it has detected in the sources that are not part of the Metathesaurus but that could be significant for information retrieval. The conversational interface makes use of the speaker-adaptive, large-vocabulary speech-recognition product from Dragon Systems, called DragonDictate for Windows, augmented by their 60,000-word medical vocabulary.

In the demonstration, we will show several example interactions with the system using queries collected from two sources. We first obtained clinical queries from residents, medical students, and oncology fellows at the Stanford breast-cancer clinic. We also obtained a list of frequently-asked questions put by clients of the Community Breast Health Project. This organization provides support to breast-cancer patients and their families and uses on-line cancer-information resources to help answer patient questions. Preliminary usability testing of the conversational interface has been conducted, and we have adapted the interface in response to what we learned from this testing.